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# FOREST INSECT CONDITIONS

## *in the Pacific Northwest during 1964*

*by*

*P.W. Orr*
*L.F. Pettinger*
*R.E. Dolph*

INSECT AND DISEASE CONTROL BRANCH
DIVISION OF TIMBER MANAGEMENT
PACIFIC NORTHWEST REGION
U.S. DEPARTMENT OF AGRICULTURE
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This is the 17th annual report of forest insect conditions in Oregon and Washington. It is based on cooperative surveys sponsored by the Northwest Forest Pest Action Council. Many individuals and organizations made these surveys possible. Special acknowledgement is made to the principal cooperators: Oregon State Department of Forestry and Washington State Department of Natural Resources.

On July 1, 1964, two U. S. Forest Service Zone Entomologists were moved to field stations, one at Seattle, Washington and one at Bend, Oregon. These entomologists handle insect and disease survey and control problems in their respective States.

COVER BACKGROUND: The Douglas-fir beetle, Dendroctonus pseudotsugae Hopk., a serious enemy of Douglas-fir in the Northwest.

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P. W. Orr,

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and

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Insect and Disease Control Branch
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Pacific Northwest Region U. S. Forest Service

U. S. Department of Agriculture

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## SURVEY FINDINGS IN BRIEF

Forest insect outbreaks occurred on 1,208,570 acres this year, the lowest total since the surveys began in 1947 (table 1). The damage trend during the past decade is as follows:

| Year | Acres infested | Year | Acres infested |
|---|---|---|---|
| 1955 | 2,248,820 | 1960 | 1,272,960 |
| 1956 | 1,410,660 | 1961 | 1,223,230 |
| 1957 | 2,129,440 | 1962 | 1,305,170 |
| 1958 | 2,032,720 | 1963 | 1,319,125 |
| 1959 | 1,448,360 | 1964 | 1,208,570 |

The extent and intensity of outbreaks by insect species are given in table 39 for Oregon and in table 40 for Washington. The generalized location of the major outbreaks is shown in figure 1.

The principal findings in 1964 were:

1. Mountain pine beetle.--Tree killing increased in western white pine and lodgepole pine in Oregon and decreased in Washington. Losses increased in stagnated ponderosa pine stands in both States. Light to moderate outbreaks occurred in sugar pine stands in southern Oregon.

2. Fir engraver.--The infested area doubled in Oregon and remained static in Washington.

3. Western pine beetle.--Infestations increased in size in Oregon but decreased in Washington. Subepidemic tree killing increased in most ponderosa pine stands, indicating a possible beetle population build-up next year.

4. Douglas-fir beetle.--Moderate to heavy losses occurred in localized areas in southwestern Oregon Coast Range and in northeastern Oregon. Outbreaks decreased in size in Washington.

5. Oregon pine ips.--Outbreaks decreased significantly in Oregon but remained static in Washington pine stands.

6. Engelmann spruce beetle.--Infestations declined significantly in both States.

7. Silver fir beetles.--Outbreaks subsided completely in Oregon and decreased in Washington.

8. Balsam woolly aphid.--The infested acreage increased in Oregon and decreased in Washington. Most of the damage occurred in subalpine fir stands along the Cascades in both States.

9. Larch casebearer.--Infestations in northeastern Washington increased in size and became more severe. No control is recommended for 1965.

10. Douglas-fir tussock moth.--Outbreaks began to subside in northeastern Washington but increased in extent and severity in central Oregon on the Malheur and Ochoco National Forests. Control is necessary in Oregon in 1965 to prevent widespread tree mortality.

11. Noctuid moth.--Light to heavy defoliation of Douglas-fir occurred on about 8,000 acres on the Siuslaw National Forest in western Oregon.

12. Western oak looper.--Outbreaks in the Willamette Valley, Oregon decreased in size. A virus disease reduced larval populations at the older infestation centers. Some additional defoliation is likely to occur at newer centers in 1965.

13. Sawfly on larch.--Small outbreaks were centered on the Wallowa-Whitman and Mt. Hood National Forests in Oregon.

14. Pine needle miner.--Light to moderate defoliation of lodgepole pine occurred on the Deschutes National Forest, Oregon. Control is unnecessary in 1965.

15. Spruce budworm.--Light to heavy infestations occurred in northeastern Washington. For the first time since the early 1940's, no epidemic outbreaks occurred in Oregon.

16. Western hemlock looper.--Some light larval feeding occurred in southwestern Washington in areas left unsprayed in 1963. Tree recovery in sprayed areas was good.

17. European pine shoot moth.--No infestations were found outside the containment zone in Washington. Spread between communities within the zone has been slow. Spread within communities has been rapid. Three years' negative survey findings in Spokane indicate that the 1961 eradication was successful.

In Portland, Oregon, 14 infested trees were found and destroyed. No other infestations were found in Oregon.

Research is being planned on biological control of the shoot moth in the Northwest.

18. Cone and seed insects.--Insect damage to Douglas-fir cones and seeds varied from 2 percent to 100 percent. Western white pine cones sustained up to 70 percent seed loss due to insects. Damage in ponderosa pine varied from none to 92 percent.

Table 1.--Summary of 1964 forest insect epidemic infestations in Oregon and Washington

| Insects 1/ | Oregon | | Washington | | Regional total | |
|---|---|---|---|---|---|---|
| | Infestation centers | Area | Infestation centers | Area | Infestation centers | Area |
| | Number | Acres | Number | Acres | Number | Acres |
| Defoliators: | | | | | | |
| Larch casebearer | 0 | 0 | 63 | 112,910 | 63 | 112,910 |
| Douglas-fir tussock moth | 9 | 40,320 | 72 | 17,700 | 81 | 58,020 |
| Noctuid moth (Douglas-fir) | 2 | 8,440 | 0 | 0 | 2 | 8,440 |
| Western oak looper | 22 | 6,430 | 0 | 0 | 22 | 6,430 |
| Unknown sawfly (larch) | 3 | 2,680 | 0 | 0 | 3 | 2,680 |
| Needleminer (lodgepole pine) | 2 | 2,800 | 0 | 0 | 2 | 2,800 |
| Spruce budworm | 0 | 0 | 3 | 2,800 | 3 | 2,800 |
| Western hemlock looper | 0 | 0 | 8 | 650 | 8 | 650 |
| All defoliators | 38 | 60,670 | 146 | 134,060 | 184 | 194,730 |
| Sucking insects: | | | | | | |
| Balsam woolly aphid | 327 | 148,040 | 88 | 35,380 | 415 | 183,420 |
| All sucking insects | 327 | 148,040 | 88 | 35,380 | 415 | 183,420 |
| Bark beetles: | | | | | | |
| Mountain pine beetle (W) | 267 | 92,700 | 403 | 175,990 | 670 | 268,690 |
| Mountain pine beetle (L) | 175 | 55,790 | 15 | 8,770 | 190 | 64,560 |
| Mountain pine beetle (P) | 147 | 42,440 | 41 | 13,830 | 188 | 56,270 |
| Mountain pine beetle (S) | 12 | 6,160 | 0 | 0 | 12 | 6,160 |
| Fir engraver | 348 | 120,820 | 76 | 15,220 | 424 | 136,040 |
| Western pine beetle | 327 | 111,310 | 71 | 24,100 | 398 | 135,410 |
| Douglas-fir beetle | 1,461 | 130,300 | 121 | 18,110 | 1,582 | 148,410 |
| Oregon pine ips | 62 | 7,370 | 24 | 2,080 | 86 | 9,450 |
| Engelmann spruce beetle | 27 | 3,600 | 6 | 600 | 33 | 4,200 |
| Silver fir beetles | 0 | 0 | 6 | 1,230 | 6 | 1,230 |
| All bark beetles | 2,821 | 570,490 | 763 | 259,930 | 3,589 | 830,420 |
| All insects | 3,191 | 779,200 | 997 | 429,370 | 4,188 | 1,208,570 |

1/ Mountain pine beetle infestations are separated by tree species: W, western white pine; L, lodgepole pine; P, ponderosa pine; S, sugar pine.

## INTRODUCTION

Epidemic infestations were detected, evaluated, and mapped as to intensity from the air. Ground surveys included intensive biological evaluation surveys to routine checking to verify the accuracy of aerial mapping. Individual insects are discussed below according to the extent of their outbreaks and not necessarily by their present or future destructiveness.

## DEFOLIATORS

Standards used for mapping forest defoliator outbreaks are as follows:

| Intensity | Appearance of Damage |
|---|---|
| Light | Barely visible from the air. |
| Moderate | Top 1/4 of tree defoliated. |
| Heavy | Top 1/2 of tree defoliated. |
| Very heavy | Top 3/4 of tree defoliated, some tree killing in progress. |

### LARCH CASEBEARER
### *Coleophora laricella* (Hübner)

Outbreaks increased considerably in size and intensity in northeastern Washington (table 2). This is a part of the larger, more severe infestation centered in northern Idaho. The defoliation ranged from very light to extreme, but no tree mortality occurred. The heaviest outbreak centers were located near Spokane, Washington on Mica Peak and Mt. Spokane (table 3). Lighter infestations occurred in most larch stands from the Idaho line westward to Ford, Washington. We expect this insect to continue its westward spread to the Columbia River. No casebearer outbreak has been found in larch stands in Oregon.

An accelerated program for rearing and release of the parasite, *Agathis pumila*, was begun in Idaho this year to establish colonies of the parasite in infested areas. Spray tests in Idaho show that undiluted technical malathion applied at the rate of 8 ounces per acre gave excellent control.

Table 2.--Trend of epidemic larch casebearer infestations

Northeast Washington, 1960-64

(In acres)

| Year | Intensity of infestation | | | | All intensities |
|---|---|---|---|---|---|
| | Light | Moderate | Heavy | Very heavy | |
| 1960 | 1,920 | 0 | 0 | 0 | 1,920 |
| 1961 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 2,720 | 2,560 | 0 | 0 | 5,280 |
| 1963 | 21,940 | 3,750 | 6,440 | 4,900 | 37,030 |
| 1964 | 61,000 | 28,540 | 14,900 | 8,470 | 112,910 |

Table 3.--Extent of larch casebearer infestations

in Washington in 1964, by reporting area

and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation | | | | All intensities |
|---|---|---|---|---|---|---|
| | | Light | Moderate | Heavy | Very heavy | |
| | Number | Acres | | | | |
| Washington: | | | | | | |
| Northeast Washington (W.S.D.N.R.) | 31 | 46,980 | 19,120 | 11,900 | 4,530 | 82,530 |
| Kaniksu N.F. | 31 | 13,820 | 9,420 | 3,000 | 3,940 | 30,180 |
| Colville N.F. | 1 | 200 | 0 | 0 | 0 | 200 |
| Washington areas | 63 | 61,000 | 28,540 | 14,900 | 8,470 | 112,910 |
| Regional total | 63 | 61,000 | 28,540 | 14,900 | 8,470 | 112,910 |

1/ N.F., National Forest; W.S.D.N.R., Washington State Department of Natural Resources

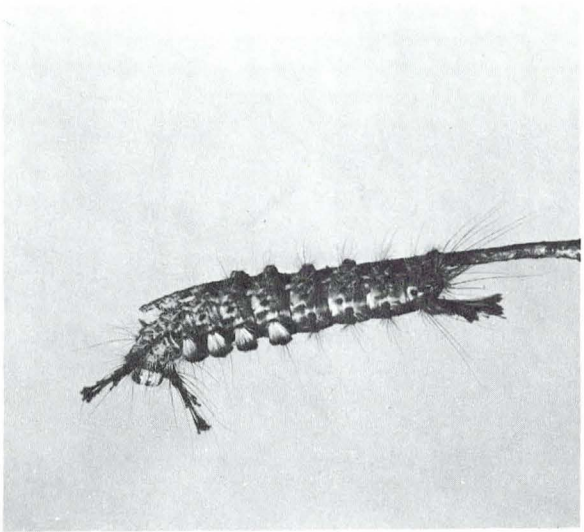
DOUGLAS-FIR TUSSOCK MOTH
Hemerocampa pseudotsugata McD.

Outbreaks increased in size and intensity in Oregon and Washington (table 4). Infestations were centered around Spokane and Colville in northeastern Washington (table 5). The size of infestations ranged from a few trees on farm woodlots to a thousand acres or more in young Douglas-fir stands. In 1964, landowners in the Coulee Creek drainage near Spokane sprayed about 300 acres with DDT to prevent extensive tree killing. More infested timber in this area may be sprayed in 1965 to save trees until natural control factors become effective. A virus disease decimated the larval populations at older infestation centers but not before serious tree killing occurred. The prognosis for 1965 is for lighter defoliation and less tree killing.

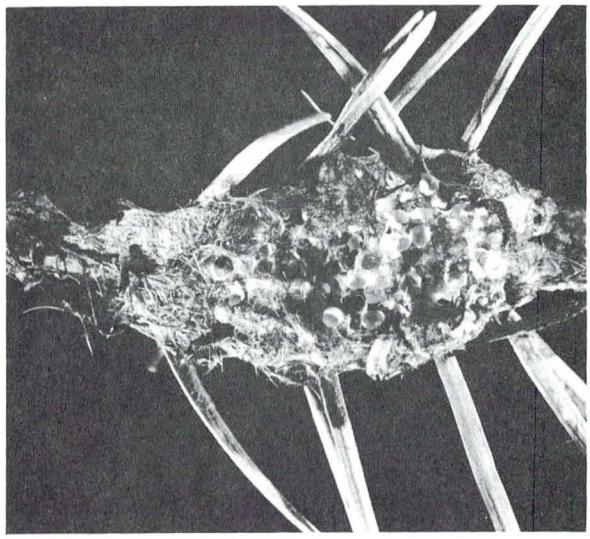
In Oregon, three large centers with severe tree damage developed on the Malheur National Forest near Antelope Mountain, King Mountain, and Gold Hill. Less extensive defoliation occurred in the Vance Creek drainage, south of John Day. At these centers, true firs and Douglas-fir were the chief hosts but pines and western larch in the understory were also defoliated to varying degrees. Defoliation ranged from light to very heavy. Some tree killing and top killing has already occurred and more is likely in 1965 unless the insect is controlled.

One center of light defoliation occurred on the Ochoco National Forest near Silver Springs. Most of the defoliation was on the overstory true firs and mature Douglas-firs. No tree killing has occurred at this center but conditions here are similar to those at Antelope Mountain on the Malheur National Forest the year before the current epidemic developed.

Biological evaluation surveys late in 1964 showed that natural factors such as a virus disease and insect parasites would not control the outbreak in 1965 early enough to prevent serious tree mortality. After visiting the area and weighing the cost-benefit values, the Northwest Forest Pest Action Council recommended aerial spraying with DDT until natural controls become effective.



Mature Douglas-fir tussock moth larva feeding on true fir foliage.



Hatched eggs on tussock moth cocoons.

Young true fir stand heavily defoliated by the Douglas-fir tussock moth.

Table 4.--Trend of Douglas-fir tussock moth infestations in Oregon and Washington, 1963-64

(In acres)

| Year | Area of epidemic infestation | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1963 | 0 | 1,515 | 1,515 |
| 1964 | 40,320 | 17,700 | 58,020 |

Table 5.--Extent of Douglas-fir tussock moth infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation | | | | |
|---|---|---|---|---|---|---|
| | | Light | Moderate | Heavy | Very heavy | All intensities |
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Malheur N.F. | 4 | 23,560 | 6,160 | 6,050 | 3,190 | 38,960 |
| Ochoco N.F. | 5 | 1,360 | 0 | 0 | 0 | 1,360 |
| Oregon areas | 9 | 24,920 | 6,160 | 6,050 | 3,190 | 40,320 |
| Washington: | | | | | | |
| N.E. Washington (W.S.D.N.R.) | 50 | 5,380 | 3,530 | 4,150 | 1,200 | 14,260 |
| Colville N.F. | 22 | 2,200 | 1,060 | 180 | 0 | 3,440 |
| Washington areas | 72 | 7,580 | 4,590 | 4,330 | 1,200 | 17,700 |
| Regional total | 81 | 32,500 | 10,750 | 10,380 | 4,390 | 58,020 |

1/ N.F., National Forest; W.S.D.N.R., Washington State Department of Natural Resources.

## A NOCTUID ON DOUGLAS-FIR
## *Xylomyges simplex* Wlk.

About 8,000 acres of Douglas-fir were defoliated in 1964 near Harlan, Oregon (table 6). Outbreaks of this noctuid moth are rare in the Pacific Northwest. Little is known about the insect's habits but it is apparently a solitary defoliator. Since this insect is generally kept under control by natural factors, no control is necessary for 1965. The trend of the infestation will be closely followed.

Table 6.--Extent of Noctuid moth infestation in Oregon in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon | | | | | | |
| Siuslaw N.F. | 2 | 0 | 8,440 | 0 | 0 | 8,440 |
| Oregon areas | 2 | 0 | 8,440 | 0 | 0 | 8,440 |
| Regional total | 2 | 0 | 8,440 | 0 | 0 | 8,440 |

1/ N.F., National Forest.

SAWFLY ON LARCH
Neodiprion sp.

Western larch stands in Oregon were lightly to heavily defoliated by an unknown sawfly in 1964 (table 7). The largest infestation center occurred on the Mt. Hood National Forest in Barlow Creek, Bonney Creek, and White River drainages. Ground checks revealed the pupae were heavily parasitized. Smaller infestation centers continued on the Wallowa-Whitman National Forest in Bear Creek and Sturgill Creek drainages. No tree killing was observed on either Forest. Apparently western larch can tolerate some defoliation for a few seasons without any lasting stand damage.

The trend of this year's population will be closely followed. No control is needed in 1965.

Table 7.--Extent of sawfly on larch in Oregon in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Mt. Hood N.F. | 1 | 2,520 | 0 | 0 | 0 | 2,520 |
| Wallowa-Whitman N.F. | 2 | 160 | 0 | 0 | 0 | 160 |
| Oregon areas | 3 | 2,680 | 0 | 0 | 0 | 2,680 |
| Regional total | 3 | 2,680 | 0 | 0 | 0 | 2,680 |

1/ N.F., National Forest.

## UNKNOWN NEEDLE MINER ON LODGEPOLE PINE

Defoliation of lodgepole pine by a needle miner, probably Recurvaria sp., occurred near the Wickiup and Crane Prairie Reservoirs, Deschutes National Forest, Oregon (table 8). No tree killing is anticipated, but continued defoliation next year may weaken the trees so that they will become attractive to bark beetles. The trend is not known, but will be followed closely. Control is not necessary in 1965.

Table 8.--Extent of needle miner infestation in lodgepole pine in Oregon in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Deschutes N.F. | 2 | 0 | 2,800 | 0 | 0 | 2,800 |
| Oregon areas | 2 | 0 | 2,800 | 0 | 0 | 2,800 |
| Regional total | 2 | 0 | 2,800 | 0 | 0 | 2,800 |

1/ N.F., National Forest.

SPRUCE BUDWORM

Choristoneura fumiferana (Clem.)

Epidemic outbreaks of the spruce budworm were at the lowest level since the beginning of record keeping in 1947. Defoliation declined in both States (table 9). No epidemic outbreaks were recorded in Oregon; however, subepidemic populations were found on the Fremont National Forest and other southern Oregon forest areas during the annual spruce budworm egg mass evaluation survey. The predicted population trend for this area is downward to static. Infestations in Washington were centered on the Kaniksu National Forest but defoliation was less severe than last year. In addition to the Kaniksu outbreak, a new small outbreak developed on Deadman Hill southwest of Colville (table 10).

Table 9.--Trend of spruce budworm infestations in Oregon and Washington, 1960-64

(In acres)

| Year | Area of epidemic infestations | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 264,560 | 20,960 | 285,520 |
| 1961 | 55,200 | 29,600 | 84,000 |
| 1962 | 48,370 | 0 | 48,370 |
| 1963 | 49,040 | 10,200 | 59,240 |
| 1964 | 0 | 2,800 | 2,800 |

Table 10.--Extent of spruce budworm infestations in Washington in 1964 by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Washington: | | | | | | |
| Kaniksu N.F. | 1 | 1,310 | 440 | 310 | 0 | 2,060 |
| Colville N.F. | 2 | 230 | 510 | 0 | 0 | 740 |
| Washington areas | 3 | 1,540 | 950 | 310 | 0 | 2,800 |
| Regional total | 3 | 1,540 | 950 | 310 | 0 | 2,800 |

1/ N.F., National Forest.

## WESTERN HEMLOCK LOOPER

Lambdina fiscellaria lugubrosa Hulst

Severe infestations of the hemlock looper subsided completely in Oregon and decreased in severity and extent in Washington (table 11). Timely aerial spray programs are credited with controlling the outbreaks. The few remaining isolated centers of light and moderate defoliation were on Long Island, Bear River, Finn Creek, and South Nemah River in southwestern Washington (table 12). These infestations are expected to decline naturally; hence, no control is needed in 1965.

Table 11.--Trend of western hemlock looper infestations in Oregon and Washington, 1961-64

(In acres)

| Year | Area of epidemic infestations | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1961 | 11,000 | 0 | 11,000 |
| 1962 | 1,060 | 5,990 | 7,050 |
| 1963 | 540 | 8,040 | 8,580 |
| 1964 | 0 | 650 | 650 |

Table 12.--Extent of Western hemlock looper infestations in Washington in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Washington: | | | | | | |
| Southwest Washington (W.S.D.N.R.) | 8 | 330 | 320 | 0 | 0 | 650 |
| Washington areas | 8 | 330 | 320 | 0 | 0 | 650 |
| Regional total | 8 | 330 | 320 | 0 | 0 | 650 |

1/ W.S.D.N.R., Washington State Department of Natural Resources.

## WESTERN OAK LOOPER

Lambdina fiscellaria sominiaria (Hulst)

The extent of the outbreak decreased this year (table 13). Defoliation of Oregon white oak and Oregon ash occurred near Wren, Willamina, McMinnville, Yamhill, and other widely scattered areas in the Willamette Valley of Oregon (table 14). No control is necessary in 1965 since these outbreaks seldom persist in an area long enough to cause tree mortality. Usually infested trees will refoliate later in the season after the larvae have completed their feeding. Apparently a virus disease is controlling the larvae populations in the older infestation centers. Some spread and development of new infestation centers is expected in 1965 followed by a gradual decrease in intensity and extent of damage.

Table 13.--Trend of western oak looper infestation in Oregon, 1960-64

(In acres)

| Year | Intensity of infestation | | | | All intensities |
|---|---|---|---|---|---|
| | Light | Moderate | Heavy | Very heavy | |
| 1960 | 0 | 0 | 0 | 2,080 | 2,080 |
| 1961 | 0 | 5,760 | 960 | 160 | 6,880 |
| 1962 | 1,240 | 0 | 0 | 0 | 1,240 |
| 1963 | 6,120 | 3,990 | 4,760 | 1,880 | 16,750 |
| 1964 | 5,670 | 640 | 120 | 0 | 6,430 |

Table 14.--Extent of western oak looper in Oregon in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Siuslaw N.F. | 22 | 5,670 | 640 | 120 | 0 | 6,430 |
| Oregon areas | 22 | 5,670 | 640 | 120 | 0 | 6,430 |
| Regional total | 22 | 5,670 | 640 | 120 | 0 | 6,430 |

1/ N.F., National Forest.

EUROPEAN PINE SHOOT MOTH

Rhyacionia buoliana (Schiff.)

A containment zone was established in the Puget Sound area of Washington soon after the discovery of the moth at Bellevue in 1959. The purpose of the zone is to prevent spread of the infestation by movement of infested stock. Each year, surveys have been made both inside and outside of the containment zone to detect new outbreaks of the shoot moth. Spread of the shoot moth infestation between communities in the containment zone has been slow, but stead--mostly by movement of infested trees. Its spread within infested communities has been rapid by movement of infested stock as well as by moth flight.

In Washington 41 communities outside the containment zone were surveyed but no European pine shoot moth infestations were found. With the exception of a few trees in Portland, no infested pines were found in the 63 communities surveyed in Oregon in 1964.

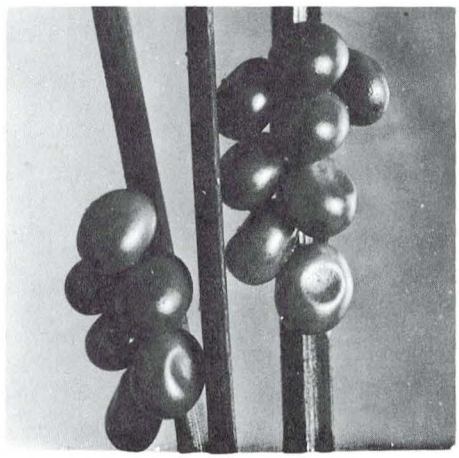
Negative survey findings for the third successive year in Spokane, Washington indicate the 1961 eradication operation was successful. Spokane, Washington is considered free of the shoot moth and Spokane County should be removed from the list of quarantined counties in Washington.

During 1964 eradication surveys in Portland, Oregon, 14 infested pines were discovered and destroyed before moth flight. Thirteen of the trees were within a one-half mile circle in a southeast Portland neighborhood and the other was about two miles east in a city park. Some of the infested trees were tall and the infestations had been overlooked during earlier surveys. Infestations on the smaller pines probably developed in 1963. Eradication surveys will be continued in Portland, Oregon until the European pine shoot moth threat has been eliminated.

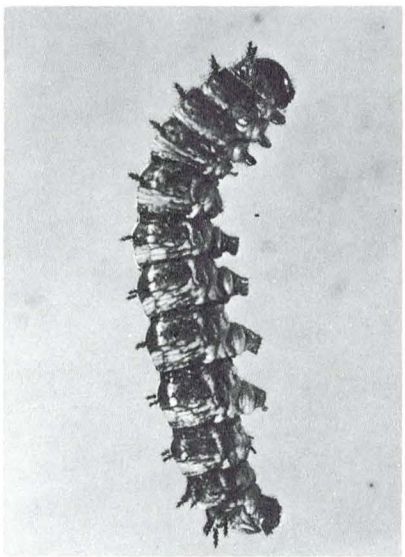
PANDORA MOTH

Coloradia pandora Blake

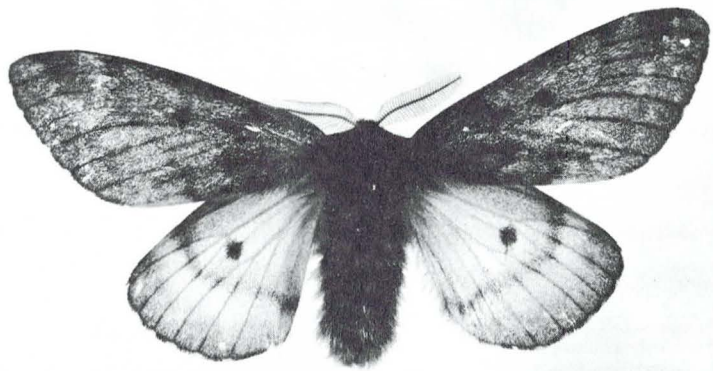
Mass moth flights were attracted to lighted store fronts at Chemult, Oregon, late in August. Eggs were deposited on signs, posts, shingles, and windows. Subsequent evaluation surveys in nearby lodgepole pine stands showed that egg laying had been light and feeding damage by first-year larvae was insignificant. This feeding was confined to less than 1,000 acres. Feeding by the second-year larvae is expected to be somewhat heavier in 1965, but not severe enough to warrant control. Tests are being made at the U. S. Forest Service Pesticide Evaluation Unit at Berkeley, California to find effective, but less persistent insecticides for control of the pandora moth and other forest defoliators. If such an insecticide is found, a pilot spray test may be undertaken against the pandora moth in 1965.



Pandora moth eggs on a pine needle.



Pandora moth larva



Pandora moth adult

## OTHER DEFOLIATORS

The pine needle-sheath miner, Zellaria haimbachi Busck, was fairly common on various pines in Oregon and Washington, but caused no serious damage. Flights of western phantom hemlock looper, Nepytia phantasmaria (Strech), were heavy in east Portland, Oregon late in the fall. Egg deposition on Douglas-fir was heavy. The rusty spotted tussock moth, Orgyia antiqua (L.), defoliated huckleberry and other low browse plants over wide areas on the Chesnimnus Ranger District, Wallowa-Whitman National Forest, Oregon. A virus disease was present and egg parasites were abundant. Mountain mahogany on extensive areas on and near the Malheur and Ochoco National Forests in Central Oregon was lightly to heavily defoliated by a caterpillar, Ethmia discostigella (Chamb.). None of the mountain mahogany was killed but the amount of browse available for winter game use was reduced.

BALSAM WOOLLY APHID

Chermes piceae (Ratz)

Outbreaks of the balsam woolly aphid on true firs increased in Oregon but decreased significantly in Washington (table 15). Tree killing occurred in grand fir, Pacific silver fir, and subalpine fir stands.

The most extensive subalpine fir mortality occurred on the Willamette, Rogue River, Umpqua, Mt. Hood and Deschutes National Forests in Oregon. The insect has become well established in the southern Oregon Cascades, at Crater Lake National Park and tributary streams of the upper Rogue River (table 16). In the Coast Range, infestations have spread southward and are now found near Coquille, Oregon in grand fir stands.

In Washington mortality was most extensive on subalpine fir on Gifford Pinchot and Snoqualmie National Forests (table 16).

Control of the aphid by predators has been tested for several years with discouraging results. Chemical control is impractical under forest conditions except at high value recreational and scenic areas. About all that can be done is to harvest all merchantable infested trees and recently dead trees to save timber values that might otherwise be lost.

Table 15.--Trend of balsam woolly aphid infestations in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of epidemic infestation | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 66,440 | 760 | 67,200 |
| 1961 | 78,080 | 2,320 | 80,400 |
| 1962 | 51,800 | 4,710 | 56,510 |
| 1963 | 102,145 | 85,310 | 187,455 |
| 1964 | 148,040 | 35,380 | 183,420 |

Table 16.--Extent of balsam woolly aphid infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Willamette N.F. | 136 | 63,200 | 8,680 | 880 | 0 | 72,760 |
| Rogue River N.F. | 16 | 14,760 | 2,720 | 1,120 | 160 | 18,760 |
| Umpqua N.F. | 42 | 12,640 | 3,410 | 1,810 | 100 | 17,960 |
| Mt. Hood N.F. | 58 | 15,400 | 2,260 | 0 | 0 | 17,660 |
| Deschutes N.F. | 54 | 8,240 | 7,600 | 1,480 | 0 | 17,320 |
| Warm Springs I.R. | 7 | 1,380 | 0 | 0 | 0 | 1,380 |
| Crater Lake N.P. | 8 | 920 | 400 | 0 | 0 | 1,320 |
| Coos District (O.S.D.F.) | 3 | 280 | 240 | 0 | 0 | 520 |
| Siuslaw N.F. | 1 | 340 | 0 | 0 | 0 | 340 |
| Northwest Oregon (O.S.D.F.) | 2 | 20 | 0 | 0 | 0 | 20 |
| Oregon areas | 327 | 117,180 | 25,310 | 5,290 | 260 | 148,040 |
| Washington: | | | | | | |
| Gifford Pinchot N.F. | 53 | 17,900 | 5,560 | 2,400 | 0 | 25,860 |
| Snoqualmie N.F. | 24 | 4,320 | 1,320 | 160 | 0 | 5,800 |
| Mt. Rainier N.P. | 6 | 640 | 0 | 480 | 0 | 1,120 |
| Southwest Washington (W.S.D.N.R.) | 1 | 1,040 | 0 | 0 | 0 | 1,040 |
| Yakima I.R. | 2 | 440 | 400 | 0 | 0 | 840 |
| Wenatchee N.F. | 2 | 720 | 0 | 0 | 0 | 720 |
| Washington areas | 88 | 25,060 | 7,280 | 3,040 | 0 | 35,380 |
| Regional total | 415 | 142,240 | 32,590 | 8,330 | 260 | 183,420 |

1/ N.F., National Forest; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry.

## BARK BEETLES

The intensity of a bark beetle infestation is based upon the number of trees infested per section and the number of infested trees in a group, as shown below:

| Timber type | Infestation intensity | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Light | | Moderate | | Heavy | | Very heavy | |
| | Trees per section | Trees per group | Trees per section | Trees per group | Trees per section | Trees per group | Trees per section | Trees per group |
| | - - - - Number - - - - | | | | | | | |
| Ponderosa pine | 20-50 | 5 | 50-100 | 10 | 100-200 | 20 | 200+ | 20+ |
| Lodgepole pine and western white pine | 50-350 | 50 | 350-1,000 | 200 | 1,000-2,600 | 400 | 2,600+ | 400+ |
| Douglas-fir | 20-50 | 5 | 50-100 | 15 | 150-300 | 30 | 300+ | 30+ |
| True firs, Engelmann spruce, and western white pine | 20-50 | 5 | 50-100 | 15 | 150-300 | 30 | 300+ | 30+ |

DOUGLAS-FIR BEETLE

Dendroctonus pseudotsugae Hopk.

Douglas-fir beetle damage in Oregon was considerably higher in 1964 than in 1963, and reached an all-time low in Washington (table 26).

The trend of the Douglas-fir beetle outbreaks in Oregon is upward. The largest and most severe outbreak occurred in northeast Oregon on the Wallowa-Whitman National Forest (table 27). As anticipated in 1963, a widespread epidemic developed in the Douglas-fir stands of western Oregon. An estimated 250 to 500 million board feet of timber has been killed and more losses are expected in 1965. In 1964, losses were particularly heavy on the Siskiyou and Siuslaw National Forests and in Lane, Coos, and Douglas Counties. Damage was light elsewhere. In Washington, the trend is downward. The anticipated outbreak in western Washington failed to materialize. Tree killing on the West Side Washington Forests was very low (table 27). The majority of the beetle damage occurred in eastern Washington on or near the Okanogan and Colville National Forests.

Removal of all infested trees from the woods is essential to minimize future beetle attacks and deterioriation of the timber. This can be accomplsihed efficiently by salvage logging. In conjunction with the regular salvage program, there is reason to believe that trap trees might be of benefit in absorbing attacking beetles in the spring of 1965. Efficacy of this method of combatting the Douglas-fir beetle has not been tested experimentally in the Northwest.

Douglas-fir Beetle Gallery

Much of the windthrow resulting from the 1962 Columbus Day storm and subsequent storms is still attractive and may be attacked by the Douglas-fir beetle in 1965. All accessible windthrow should be removed from the woods as quickly as possible to minimize the beetle buildup.

Table 26.--Trend of Douglas-fir beetle infestations in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of epidemic infestations | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 114,160 | 104,440 | 218,600 |
| 1961 | 70,120 | 99,140 | 169,260 |
| 1962 | 26,540 | 55,990 | 82,530 |
| 1963 | 24,545 | 60,700 | 85,245 |
| 1964 | 112,190 | 18,110 | 130,300 |

## MOUNTAIN PINE BEETLE

Dendroctonus ponderosae Hopk.

Regionwide, the total infested acreage in western white pine, lodgepole pine, and ponderosa pine decreased substantially but increased in sugar pine stands (table 17). Heavy tree killing resulted at several localities. The situation by tree species is as follows:

Western white pine.--The mountain pine beetle continued to cause heavy losses in western white pine stands in both Washington and Oregon. The majority of the tree killing occurred in inaccessible, wilderness, and other dedicated areas.

Although a definite downward trend occurred in Washington, losses remained high. The heaviest damage occurred on the Olympic National Park and the Gifford Pinchot, Snoqualmie, and Wenatchee National Forests (table 18). Tree killing persisted on all forests in the Cascade Range and on the Olympic Peninsula.

In Oregon, losses increased over last year's total (table 17). Most of this year's tree killing centered on the Willamette, Mt. Hood, Siskiyou, and Umpqua National Forests. Subepidemic losses were observed on forests along the Cascade Mountains.

Lodgepole pine.--Mortality in lodgepole pine stands increased slightly in Oregon and decreased in Washington resulting in a static overall loss (table 17). The heavier losses occurred on the Fremont, Winema, and Deschutes National Forests in Oregon, and on the Colville and Okanogan National Forests of Washington (table 19).

Ponderosa pine.--Attacks in young stagnated ponderosa pine stands increased considerably in Oregon and Washington. The heaviest loss occurred on the Wallowa-Whitman National Forest in Oregon. Additional losses were centered on the Malheur and Umatilla National Forests in Oregon and on the Okanogan and Colville National Forests in Washington (table 20).

Sugar pine.--Light to moderate tree killing occurred in mature sugar pine stands of Southern Oregon. Most losses were reported on the Siskiyou National Forest and on the Bureau of Land Management's Roseburg District in Douglas County (table 21).

Control.--Control is impractical in western white pine in the Cascade Mountains because of the scattered occurrence of white pine, economy of logging, and prevalence of blister rust. To reduce beetle populations and save timber values, salvaging of merchantable infested trees is encouraged.

Maintenance control of the beetle in lodgepole pine stands was done in Crater Lake National Park in 1964. Control will be done as necessary in 1965.

In unmerchantable, stagnated ponderosa pine stands, thinning is recommended to improve growth and reduce beetle hazard. Vigorous, well-spaced trees appear to be less susceptible to attack. Merchantable beetle-infested sugar pine should be logged before the beetles fly to aid in reducing the beetle population and save timber values that would otherwise be lost.

Table 17.--Trend of mountain pine beetle infestations in Oregon and Washington, by host species, 1960-64[1/]

(In acres)

| Year of detection | Area of epidemic infestations | | | | | | | Regional total, all species |
|---|---|---|---|---|---|---|---|---|
| | Oregon | | | | Washington | | | |
| | W | L | P | S | W | L | P | |
| 1960 | 31,040 | 40,080 | 14,520 | 480 | 209,400 | 6,440 | 4,740 | 306,700 |
| 1961 | 114,380 | 77,680 | 16,640 | 0 | 291,760 | 1,520 | 1,200 | 503,180 |
| 1962 | 73,720 | 65,200 | 3,820 | 160 | 349,770 | 3,050 | 1,340 | 497,060 |
| 1963 | 67,845 | 50,220 | 32,220 | 0 | 410,540 | 17,620 | 1,160 | 579,605 |
| 1964 | 92,700 | 55,790 | 42,440 | 6,160 | 175,990 | 8,770 | 13,830 | 395,680 |

1/ Host species are: W, western white pine; L, lodgepole pine; P, ponderosa pine; S, sugar pine.

Table 18.--Extent of mountain pine beetle in western white pine in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Willamette N.F. | 137 | 20,720 | 13,200 | 8,800 | 720 | 43,440 |
| Mt. Hood N.F. | 76 | 21,420 | 12,540 | 2,860 | 0 | 36,820 |
| Umpqua N.F. | 38 | 5,990 | 80 | 0 | 0 | 6,070 |
| Siskiyou N.F. | 3 | 4,340 | 0 | 0 | 0 | 4,340 |
| Deschutes N.F. | 9 | 1,200 | 0 | 440 | 0 | 1,640 |
| Warm Springs I.R. | 2 | 200 | 0 | 0 | 0 | 200 |
| Rogue River N.F. | 2 | 190 | 0 | 0 | 0 | 190 |
| Oregon areas | 267 | 54,060 | 25,820 | 12,100 | 720 | 92,700 |
| Washington: | | | | | | |
| Olympic N.P. | 61 | 39,730 | 12,110 | 4,790 | 640 | 57,270 |
| Gifford Pinchot N.F. | 55 | 16,880 | 10,870 | 3,550 | 0 | 31,300 |
| Snoqualmie N.F. | 53 | 16,120 | 4,920 | 1,360 | 240 | 22,640 |
| Wenatchee N.F. | 98 | 11,860 | 4,800 | 3,860 | 120 | 20,640 |
| Olympic N.F. | 31 | 7,830 | 6,020 | 1,840 | 180 | 15,870 |
| Kaniksu N.F. | 24 | 7,320 | 2,970 | 150 | 0 | 10,440 |
| Colville N.F. | 11 | 1,640 | 1,000 | 1,050 | 0 | 3,690 |
| Mt. Baker N.F. | 36 | 1,590 | 920 | 1,760 | 0 | 4,270 |
| Mt. Rainier N.P. | 18 | 1,480 | 1,000 | 1,440 | 320 | 4,240 |
| Quinault I.R. | 3 | 2,050 | 0 | 130 | 0 | 2,180 |
| N.W. Washington (W.S.D.N.R.) | 3 | 1,420 | 140 | 0 | 0 | 1,560 |
| Yakima I.R. | 5 | 240 | 240 | 560 | 0 | 1,040 |
| N.E. Washington (W.S.D.N.R.) | 4 | 720 | 0 | 0 | 0 | 720 |
| Okanogan N.F. | 1 | 130 | 0 | 0 | 0 | 130 |
| Washington areas | 403 | 109,010 | 44,990 | 20,490 | 1,500 | 175,990 |
| Regional total | 670 | 163,070 | 70,810 | 32,590 | 2,220 | 268,690 |

1/ N.F., National Forest; I.R., Indian Reservation; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources.

Table 19.--Extent of mountain pine beetle in lodgepole pine in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Fremont N.F. | 54 | 12,430 | 7,420 | 2,100 | 0 | 21,950 |
| Winema N.F. | 55 | 8,310 | 6,410 | 1,660 | 720 | 17,100 |
| Deschutes N.F. | 26 | 2,670 | 5,660 | 770 | 0 | 9,100 |
| Malheur N.F. | 15 | 320 | 1,240 | 500 | 0 | 2,060 |
| Crater Lake N.P. | 8 | 1,880 | 120 | 0 | 0 | 2,000 |
| Wallowa-Whitman N.F. | 5 | 1,360 | 0 | 0 | 80 | 1,440 |
| Rogue River N.F. | 3 | 1,100 | 0 | 0 | 0 | 1,100 |
| Umatilla N.F. | 4 | 530 | 0 | 0 | 0 | 530 |
| Siskiyou N.F. | 2 | 190 | 0 | 0 | 0 | 190 |
| Umpqua N.F. | 2 | 160 | 0 | 0 | 0 | 160 |
| Willamette N.F. | 1 | 0 | 0 | 0 | 160 | 160 |
| Oregon areas | 175 | 28,950 | 20,850 | 5,030 | 960 | 55,790 |
| Washington: | | | | | | |
| Colville N.F. | 3 | 670 | 1,130 | 1,740 | 0 | 3,540 |
| Okanogan N.F. | 6 | 1,100 | 790 | 280 | 0 | 2,170 |
| Wenatchee N.F. | 2 | 1,120 | 680 | 0 | 0 | 1,800 |
| Colville I.R. | 1 | 0 | 180 | 0 | 0 | 180 |
| Gifford Pinchot N.F. | 2 | 680 | 200 | 0 | 0 | 880 |
| Yakima I.R. | 1 | 0 | 200 | 0 | 0 | 200 |
| Washington areas | 15 | 3,570 | 3,180 | 2,020 | 0 | 8,770 |
| Regional total | 190 | 32,520 | 24,030 | 7,050 | 960 | 64,560 |

1/ N.F., National Forest; I. R., Indian Reservation; N.P., National Park.

Table 20.--Extent of mountain pine beetle in ponderosa pine in Oregon and Washington in 1964, by reporting area and intensity of infestation

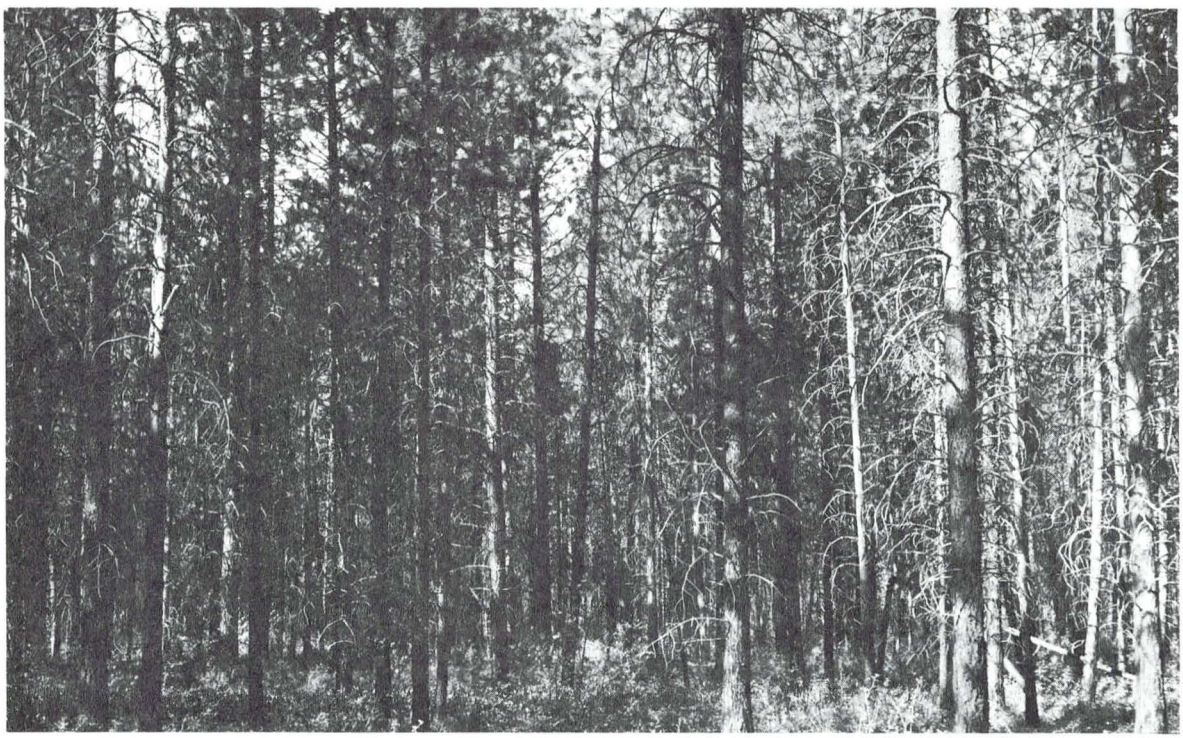
| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Wallowa-Whitman N.F. | 48 | 12,360 | 5,160 | 2,320 | 1,560 | 21,400 |
| Malheur N.F. | 23 | 3,770 | 1,540 | 1,420 | 0 | 6,730 |
| Umatilla N.F. | 20 | 4,330 | 350 | 0 | 0 | 4,680 |
| Fremont N.F. | 15 | 1,500 | 1,320 | 100 | 0 | 2,920 |
| Rogue River N.F. | 5 | 1,760 | 0 | 0 | 80 | 1,840 |
| Siskiyou N.F. | 15 | 1,480 | 120 | 0 | 0 | 1,600 |
| Ochoco N.F. | 9 | 1,340 | 0 | 0 | 0 | 1,340 |
| Winema N.F. | 3 | 890 | 0 | 20 | 0 | 910 |
| Central Oregon (O.S.D.F.) | 1 | 520 | 0 | 0 | 0 | 520 |
| Crater Lake N.P. | 1 | 200 | 0 | 0 | 0 | 200 |
| Deschutes N.F. | 3 | 120 | 0 | 0 | 0 | 120 |
| Umatilla I.R. | 1 | 80 | 0 | 0 | 0 | 80 |
| Warm Springs I.R. | 2 | 70 | 0 | 0 | 0 | 70 |
| Mt. Hood N.F. | 1 | 30 | 0 | 0 | 0 | 30 |
| Oregon areas | 147 | 28,450 | 8,490 | 3,860 | 1,640 | 42,440 |
| Washington: | | | | | | |
| Okanogan N.F. | 16 | 2,660 | 2,050 | 1,540 | 230 | 6,480 |
| Colville N.F. | 6 | 690 | 0 | 1,840 | 0 | 2,530 |
| Colville I.R. | 8 | 2,070 | 0 | 0 | 0 | 2,070 |
| Umatilla N.F. | 5 | 1,270 | 0 | 0 | 0 | 1,270 |
| Yakima I.R. | 2 | 520 | 160 | 0 | 0 | 680 |
| Glenwood District (W.S.D.N.R.) | 2 | 520 | 0 | 0 | 0 | 520 |
| Gifford Pinchot N.F. | 1 | 160 | 0 | 0 | 0 | 160 |
| Wenatchee N.F. | 1 | 0 | 0 | 0 | 120 | 120 |
| Washington areas | 41 | 7,890 | 2,210 | 3,380 | 350 | 13,830 |
| Regional total | 188 | 36,340 | 10,700 | 7,240 | 1,990 | 56,270 |

1/ N.F., National Forest; I.R., Indian Reservation; N.P., National Park, O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Natural Resources.

Table 21.--Extent of mountain pine beetle in sugar pine in Oregon in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation | | | | All intensities |
|---|---|---|---|---|---|---|
| | | Light | Moderate | Heavy | Very heavy | |
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Coos District (O.S.D.F.) | 2 | 80 | 4,520 | 0 | 0 | 4,600 |
| Siskiyou N.F. | 6 | 1,030 | 0 | 0 | 0 | 1,030 |
| Rogue River N.F. | 3 | 490 | 0 | 0 | 0 | 490 |
| Deschutes N.F. | 1 | 40 | 0 | 0 | 0 | 40 |
| Regional total | 12 | 1,640 | 4,520 | 0 | 0 | 6,160 |

1/ N.F., National Forest; O.S.D.F., Oregon State Department of Forestry.



Stagnated ponderosa pine stands such as this are prime targets for mountain pine beetle attacks.

Dense young ponderosa pines on the Wallowa-Whitman N.F., Oregon, killed by the mountain pine beetle.

FIR ENGRAVER

Scolytus ventralis Lec.

Epidemic outbreaks of the fir engraver in Washington remained static, but in Oregon, the acreage of true fir stands infested doubled in 1964 (table 22). The heaviest losses occurred on the Fremont, Wallowa-Whitman, Umatilla, and Ochoco National Forests (table 23). Most losses in Washington occurred on the Umatilla, Okanogan, Kaniksu, and Wenatchee National Forests (table 23). The infestations on Lookout Mountain and Steens Mountain in Oregon occurred in fir stands isolated by several miles from other firs. Beetle attacks in these limited stands will seriously deplete the fir.

Much of the damage occurred in overmature trees and decadent stands. Outbreaks generally develop during periods of drought and subside rapidly when moisture conditions return to normal. Since the beetle will attack some trees and produce broods without killing the tree, detection of all infestations is very difficult and makes direct control impractical. Salvage of the infested trees is recommended to recover timber values that would otherwise be lost.

Table 22.--Trend of fir engraver infestations in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of epidemic infestations | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 27,240 | 14,680 | 41,920 |
| 1961 | 43,720 | 17,800 | 61,520 |
| 1962 | 105,450 | 22,820 | 128,270 |
| 1963 | 58,280 | 15,865 | 74,145 |
| 1964 | 120,820 | 15,220 | 136,040 |

Table 23.--Extent of fir engraver beetle infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Fremont N.F. | 62 | 29,690 | 8,400 | 960 | 0 | 39,050 |
| Wallowa-Whitman N.F. | 89 | 29,560 | 6,560 | 0 | 0 | 36,120 |
| Umatilla N.F. | 111 | 21,940 | 1,660 | 440 | 0 | 24,040 |
| Ochoco N.F. | 36 | 9,490 | 440 | 0 | 0 | 9,930 |
| Malheur N.F. | 19 | 2,480 | 2,610 | 0 | 0 | 5,090 |
| Winema N.F. | 8 | 2,110 | 1,130 | 0 | 160 | 3,400 |
| Rogue River N.F. | 7 | 1,170 | 0 | 0 | 0 | 1,170 |
| Central Oregon (O.S.D.F.) | 6 | 510 | 200 | 0 | 0 | 710 |
| Lookout Mtn. (B.L.M.) | 2 | 480 | 0 | 0 | 0 | 480 |
| Deschutes N.F. | 3 | 50 | 240 | 0 | 0 | 290 |
| Steens Mtn. (B.L.M.) | 1 | 200 | 0 | 0 | 0 | 200 |
| Umatilla I.R. | 2 | 180 | 0 | 0 | 0 | 180 |
| Mt. Hood N.F. | 1 | 120 | 0 | 0 | 0 | 120 |
| Crater Lake N.P. | 1 | 40 | 0 | 0 | 0 | 40 |
| Oregon areas | 348 | 98,020 | 21,240 | 1,400 | 160 | 120,820 |
| Washington: | | | | | | |
| Umatilla N.F. | 15 | 4,000 | 0 | 0 | 0 | 4,000 |
| Okanogan N.F. | 18 | 2,970 | 540 | 0 | 0 | 3,510 |
| Wenatchee N.F. | 26 | 1,820 | 1,040 | 0 | 0 | 2,860 |
| Kaniksu N.F. | 7 | 2,510 | 330 | 0 | 0 | 2,840 |
| Snoqualmie N.F. | 3 | 840 | 0 | 0 | 0 | 840 |
| Colville N.F. | 3 | 230 | 260 | 0 | 0 | 490 |
| Yakima I.R. | 1 | 320 | 0 | 0 | 0 | 320 |
| Mt. Baker N.F. | 2 | 0 | 280 | 0 | 0 | 280 |
| Colville I.R. | 1 | 80 | 0 | 0 | 0 | 80 |
| Washington areas | 76 | 12,770 | 2,450 | 0 | 0 | 15,220 |
| Regional total | 424 | 110,790 | 23,690 | 1,400 | 160 | 136,040 |

1/ N.F., National Forest; N.P., National Park; I.R., Indian Reservation; B.L.M., Bureau of Land Management; O.S.D.F., Oregon State Department of Forestry.

WESTERN PINE BEETLE

Dendroctonus brevicomis Lec.

The area infested by the western pine beetle increased slightly in Oregon and decreased in Washington (table 24). The most extensive tree mortality this year occurred on the Malheur, Ochoco, and Fremont National Forests in Oregon and on the Yakima Indian Reservation and Okanogan and Gifford Pinchot National Forests in Washington (table 25). Elsewhere in pine areas of both States, an increase in subepidemic losses was noted, indicating a possible increase in Region-wide losses next year.

The intensity of tree mortality varied from light to very heavy in Oregon and Washington.

Losses caused by this beetle can be reduced or held to a minimum by continuing aggressive sanitation-salvage logging programs in all high-risk uncut stands.

Table 24.--Trend of western pine beetle infestations in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of epidemic infestation | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 142,520 | 18,300 | 160,820 |
| 1961 | 180,040 | 12,760 | 192,800 |
| 1962 | 392,385 | 6,380 | 398,765 |
| 1963 | 98,395 | 39,275 | 137,670 |
| 1964 | 111,310 | 24,100 | 135,410 |

Table 25.--Extent of western pine beetle infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area 1/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Malheur N.F. | 107 | 37,730 | 2,010 | 2,150 | 290 | 42,180 |
| Ochoco N.F. | 52 | 16,870 | 0 | 0 | 0 | 16,870 |
| Fremont N.F. | 40 | 10,110 | 5,880 | 0 | 0 | 15,990 |
| Winema N.F. | 26 | 9,790 | 170 | 0 | 0 | 9,960 |
| Umatilla N.F. | 37 | 8,170 | 0 | 0 | 0 | 8,170 |
| Wallowa-Whitman N.F. | 18 | 5,480 | 0 | 0 | 0 | 5,480 |
| Deschutes N.F. | 19 | 3,010 | 2,000 | 0 | 0 | 5,010 |
| Siskiyou N.F. | 10 | 3,120 | 0 | 0 | 0 | 3,120 |
| Coos District (O.S.D.F.) | 7 | 2,170 | 0 | 0 | 0 | 2,170 |
| Rogue River N.F. | 3 | 1,180 | 0 | 0 | 0 | 1,180 |
| Umpqua N.F. | 3 | 140 | 600 | 0 | 0 | 740 |
| Warm Springs I.R. | 5 | 440 | 0 | 0 | 0 | 440 |
| Oregon areas | 327 | 98,210 | 10,660 | 2,150 | 290 | 111,310 |
| Washington: | | | | | | |
| Yakima I.R. | 21 | 9,520 | 960 | 0 | 0 | 10,480 |
| Okanogan N.F. | 10 | 2,970 | 840 | 0 | 0 | 3,810 |
| Gifford Pinchot N.F. | 4 | 2,400 | 0 | 0 | 0 | 2,400 |
| Colville I.R. | 9 | 2,120 | 0 | 0 | 0 | 2,120 |
| Wenatchee N.F. | 14 | 1,660 | 80 | 0 | 0 | 1,740 |
| Spokane I.R. | 4 | 950 | 330 | 0 | 0 | 1,280 |
| Colville N.F. | 3 | 260 | 510 | 150 | 0 | 920 |
| Glenwood District (W.S.D.N.R.) | 4 | 840 | 0 | 0 | 0 | 840 |
| Umatilla N.F. | 2 | 510 | 0 | 0 | 0 | 510 |
| Washington areas | 71 | 21,230 | 2,720 | 150 | 0 | 24,100 |
| Regional total | 398 | 119,440 | 13,380 | 2,300 | 290 | 135,410 |

1/ N.F., National Forest; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Forestry.

Table 27.--Extent of Douglas-fir beetle infestation in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Wallowa-Whitman N.F. | 201 | 31,960 | 16,060 | 4,200 | 0 | 52,220 |
| Coos District (O.S.D.F.) | 601 | 13,970 | 3,500 | 1,960 | 200 | 19,630 |
| Umatilla N.F. | 73 | 9,400 | 1,240 | 0 | 0 | 10,640 |
| Siskiyou N.F. | 141 | 5,610 | 740 | 330 | 80 | 6,760 |
| Umpqua N.F. | 9 | 2,360 | 0 | 0 | 0 | 2,360 |
| Malheur N.F. | 8 | 680 | 130 | 0 | 0 | 810 |
| Willamette N.F. | 7 | 640 | 80 | 0 | 0 | 720 |
| Ochoco N.F. | 3 | 470 | 0 | 0 | 0 | 470 |
| Mt. Hood N.F. | 5 | 450 | 0 | 0 | 0 | 450 |
| Rogue River N.F. | 2 | 240 | 0 | 0 | 0 | 240 |
| Siuslaw N.F. | 290 | 17,790 | 100 | 0 | 0 | 17,890 |
| Oregon areas: | 1,340 | 83,570 | 21,850 | 6,490 | 280 | 112,190 |
| Washington: | | | | | | |
| Okanogan N.F. | 36 | 6,450 | 380 | 0 | 0 | 6,830 |
| Colville N.F. | 26 | 2,530 | 1,900 | 200 | 0 | 4,630 |
| Umatilla N.F. | 23 | 2,710 | 0 | 0 | 0 | 2,710 |
| Colville I.R. | 13 | 1,460 | 590 | 0 | 0 | 2,050 |
| Wenatchee N.F. | 7 | 480 | 280 | 0 | 0 | 760 |
| Gifford Pinchot N.F. | 5 | 460 | 0 | 0 | 0 | 460 |
| Kaniksu N.F. | 8 | 230 | 130 | 0 | 0 | 360 |
| Snoqualmie N.F. | 2 | 230 | 0 | 0 | 0 | 230 |
| Olympic N.P. | 1 | 80 | 0 | 0 | 0 | 80 |
| Washington areas: | 121 | 14,630 | 3,280 | 200 | 0 | 18,110 |
| Regional total | 1,461 | 98,200 | 25,130 | 6,690 | 280 | 130,300 |

1/ N.F., National Forest; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry, N.P., National Park.

OREGON PINE IPS

Ips pini Say

Infestations of Oregon pine ips were generally downward over the region. A substantial decline in infested acreage occurred in Oregon and a small decline occurred in Washington, (table 28). The largest losses occurred on or near the Malheur, Winema, Mt. Hood, and Rogue River National Forests in Oregon. In Washington, the majority of the damage was centered on the drier sites on and near the Colville National Forest, Spokane and Colville Indian Reservations, and Glenwood District (W.S.D.N.R.) (table 29).

No controls are needed for 1965. Proper handling of logging and thinning slash will minimize population buildups and subsequent tree killing.

Table 28.--Trend of Oregon pine ips infestations in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of epidemic infestation | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 38,160 | 3,360 | 41,520 |
| 1961 | 15,880 | 7,560 | 23,440 |
| 1962 | 43,610 | 1,970 | 45,580 |
| 1963 | 15,580 | 2,600 | 18,180 |
| 1964 | 7,370 | 2,080 | 9,450 |

Table 29.--Extent of Oregon pine ips infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Malheur N.F. | 17 | 710 | 550 | 550 | 390 | 2,200 |
| Winema N.F. | 9 | 840 | 700 | 0 | 280 | 1,820 |
| Mt. Hood N.F. | 7 | 950 | 50 | 0 | 0 | 1,000 |
| Rogue River N.F. | 3 | 880 | 0 | 0 | 0 | 880 |
| Ochoco N.F. | 6 | 740 | 0 | 0 | 0 | 740 |
| Fremont N.F. | 4 | 340 | 0 | 200 | 0 | 540 |
| Deschutes N.F. | 4 | 150 | 0 | 0 | 0 | 150 |
| Wallowa-Whitman N.F. | 12 | 40 | 0 | 0 | 0 | 40 |
| Oregon areas | 62 | 4,650 | 1,300 | 750 | 670 | 7,370 |
| Washington: | | | | | | |
| Colville I.R. | 7 | 410 | 330 | 0 | 0 | 740 |
| Glenwood District (W.S.D.N.R.) | 4 | 520 | 0 | 0 | 0 | 520 |
| Colville N.F. | 3 | 330 | 0 | 0 | 0 | 330 |
| Spokane I.R. | 4 | 150 | 50 | 0 | 0 | 200 |
| Wenatchee N.F. | 2 | 80 | 80 | 0 | 0 | 160 |
| Umatilla N.F. | 3 | 120 | 0 | 0 | 0 | 120 |
| Snoqualmie N.F. | 1 | 10 | 0 | 0 | 0 | 10 |
| Washington areas | 24 | 1,620 | 460 | 0 | 0 | 2,080 |
| Regional total | 86 | 6,270 | 1,760 | 750 | 670 | 9,450 |

1/ N.F., National Forest; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

ENGELMANN SPRUCE BEETLE
Dendroctonus obesus (Mann.)

The trend of tree killing by Engelmann spruce beetle was downward in both States. Decreases in acreage were moderate in Oregon and sharply downward in Washington (table 30). Light to moderate tree killing occurred on or near the Wallowa-Whitman and Umatilla National Forests in Oregon. In Washington, the Okanogan and Umatilla National Forests received light tree killing (table 31). In most cases the outbreak centers are located in inaccessible areas; hence, direct control is impractical. However, in accessible areas, salvage of currently infested trees of merchantable size is recommended.

Table 30.--Trend of Engelmann spruce beetle infestations in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of epidemic infestation | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 1,840 | 3,120 | 4,960 |
| 1961 | 2,560 | 5,000 | 7,560 |
| 1962 | 1,230 | 6,280 | 7,510 |
| 1963 | 4,115 | 11,015 | 15,130 |
| 1964 | 3,600 | 600 | 4,200 |

Table 31.--Extent of Engelmann spruce beetle infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Wallowa-Whitman N.F. | 21 | 2,160 | 600 | 0 | 0 | 2,760 |
| Umatilla N.F. | 6 | 780 | 60 | 0 | 0 | 840 |
| Oregon areas | 27 | 2,940 | 660 | 0 | 0 | 3,600 |
| Washington: | | | | | | |
| Umatilla N.F. | 3 | 320 | 0 | 0 | 0 | 320 |
| Okanogan N.F. | 3 | 280 | 0 | 0 | 0 | 280 |
| Washington areas | 6 | 600 | 0 | 0 | 0 | 600 |
| Regional total | 33 | 3,540 | 660 | 0 | 0 | 4,200 |

1/ N.F., National Forest.

SILVER FIR BEETLES
Pseudohylesinus spp.

For the second successive year no outbreaks of silver fir beetles occurred in Oregon. In Washington, losses were considerably less than in 1963 (table 32). Small patches of light to moderate tree killing occurred on the Mt. Baker and Snoqualmie National Forests and in the Olympic National Park (table 33). Subepidemic losses were scattered throughout many of the Pacific silver fir stands of western Washington, indicating a possible upward trend for next year.

No control other than removal of merchantable infested trees is recommended for 1965.

Table 32.--Trend of silver fir beetle infestations in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of epidemic infestation | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 0 | 3,120 | 3,120 |
| 1961 | 480 | 3,040 | 3,520 |
| 1962 | 480 | 0 | 480 |
| 1963 | 0 | 54,840 | 54,840 |
| 1964 | 0 | 1,230 | 1,230 |

Table 33.--Extent of silver fir beetle infestations in Washington in 1964, by reporting area and intensity of infestation

| Reporting area[1/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Washington: | | | | | | |
| Snoqualmie N.F. | 4 | 560 | 0 | 0 | 0 | 560 |
| Mt. Baker N.F. | 1 | 0 | 520 | 0 | 0 | 520 |
| Olympic N.P. | 1 | 150 | 0 | 0 | 0 | 150 |
| Washington areas | 6 | 710 | 520 | 0 | 0 | 1,230 |
| Regional total | 6 | 710 | 520 | 0 | 0 | 1,230 |

1/ N.F., National Forest; N.P., National Park

## DYING HEMLOCK

Mature western hemlock dying from unknown causes was restricted to Washington Forests this year (table 34) where the heaviest damage was recorded on or near Mt. Baker and Olympic National Forests and in Olympic National Park (table 35).

Salvage of the merchantable dead and distressed timber in accessible areas is recommended.

Table 34.--Trend of dying hemlock in Oregon and Washington, 1960-64

(In acres)

| Year of detection | Area of damage | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 2,000 | 33,120 | 35,120 |
| 1961 | 480 | 353,040 | 353,520 |
| 1962 | 1,280 | 223,680 | 224,960 |
| 1963 | 3,820 | 160,320 | 164,140 |
| 1964 | 0 | 203,460 | 203,460 |

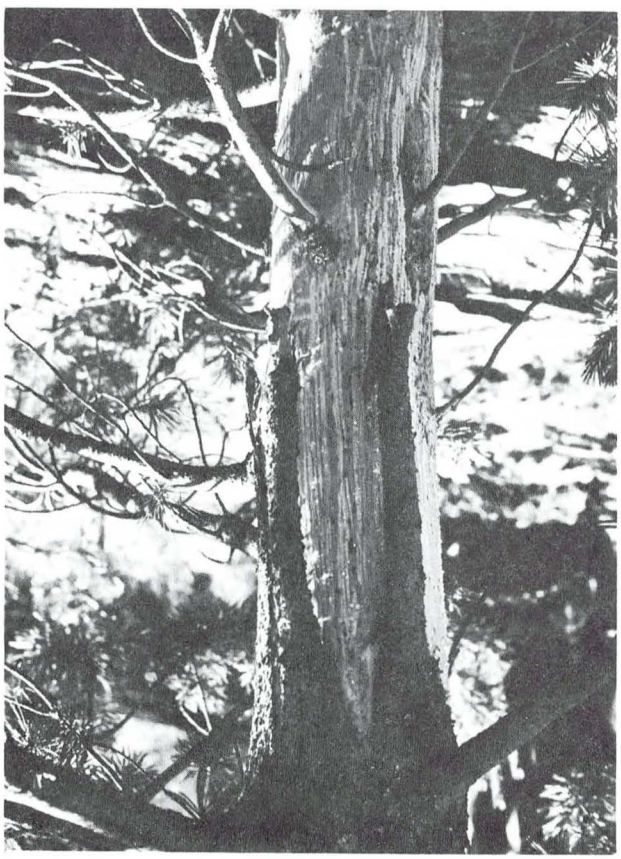
Table 35.--Extent of dying hemlock in Washington in 1964, by reporting area and intensity of damage

| Reporting area[1/] | Damage centers | Intensity of damage: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Washington: | | | | | | |
| Mt. Baker N.F. | 135 | 62,260 | 41,000 | 10,120 | 1,960 | 115,340 |
| Olympic N.F. | 28 | 47,050 | 13,780 | 0 | 0 | 60,830 |
| Olympic N.P. | 5 | 19,020 | 2,430 | 0 | 0 | 21,450 |
| N.W. Washington (W.S.D.N.R.) | 6 | 2,720 | 360 | 1,920 | 840 | 5,840 |
| Washington areas | 174 | 131,050 | 57,570 | 12,040 | 2,800 | 203,460 |

1/ N.F., National Forest; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources.

## TREE DAMAGE BY BEARS

Tree killing and tree damage caused by black bears decreased in both States (table 36). The most severe and widespread damage in Oregon occurred on the Northwest Oregon District and on and near the Willamette National Forest. In Washington the bear damage centers were located on or near the Olympic and Gifford Pinchot National Forests (table 37). Much of this type of damage is in already understocked stands.



A young tree girdled by bears.

Plot examinations by Gifford Pinchot National Forest personnel showed that bears killed or severely damaged between 16 percent and 46 percent of the trees in 18 to 40-year-old Douglas-fir and western hemlock stands. This loss left the stands much below the recommended stocking for the site and age classes.

Table 36.--Trend of tree damage caused by bears in western Oregon and western Washington, 1960-64

(In acres)

| Year of detection | Area of damage | | Regional total |
|---|---|---|---|
| | Oregon | Washington | |
| 1960 | 33,720 | 18,980 | 52,700 |
| 1961 | 129,920 | 113,400 | 243,320 |
| 1962 | 109,700 | 27,405 | 137,105 |
| 1963 | 65,540 | 150,070 | 215,610 |
| 1964 | 53,290 | 73,280 | 126,570 |

Table 37.--Extent of tree damage caused by bears in Oregon and Washington in 1964, by reporting area and intensity of damage

| Reporting area[1/] | Damage centers | Intensity of damage: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Oregon: | | | | | | |
| Northwest Oregon (O.S.D.F.) | 50 | 26,420 | 10,020 | 1,330 | 0 | 37,770 |
| Willamette N.F. | 15 | 6,080 | 800 | 320 | 0 | 7,200 |
| Siuslaw N.F. | 35 | 5,380 | 1,720 | 0 | 0 | 7,100 |
| Mt. Hood N.F. | 8 | 960 | 0 | 0 | 0 | 960 |
| Umpqua N.F. | 3 | 100 | 80 | 0 | 0 | 180 |
| Siskiyou N.F. | 2 | 80 | 0 | 0 | 0 | 80 |
| Oregon areas | 113 | 39,020 | 12,620 | 1,650 | 0 | 53,290 |
| Washington: | | | | | | |
| Olympic N.F. | 55 | 28,060 | 3,890 | 440 | 0 | 32,390 |
| Gifford Pinchot N.F. | 25 | 9,580 | 8,800 | 160 | 680 | 19,220 |
| Southwest Washington (W.S.D.N.R.) | 22 | 8,860 | 2,160 | 1,370 | 0 | 12,390 |
| Snoqualmie N.F. | 10 | 5,660 | 900 | 200 | 0 | 6,760 |
| Quinault I.R. | 5 | 1,820 | 460 | 0 | 0 | 2,280 |
| Yakima I.R. | 1 | 240 | 0 | 0 | 0 | 240 |
| Washington areas | 118 | 54,220 | 16,210 | 2,170 | 680 | 73,280 |
| Regional total | 231 | 93,240 | 28,830 | 3,820 | 680 | 126,570 |

1/ N.F., National Forest; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Natural Resources.

## APPENDIX

### Organization and Conduct of Aerial Surveys

Aerial surveys to detect outbreaks of important forest insects were a cooperative undertaking by Oregon State Department of Forestry and U. S. Forest Service in Oregon, and between Washington State Department of Natural Resources and the Forest Service in Washington. Detection survey flights were made in early June to detect larch casebearer damage in northeastern Washington. Regular detection surveys were made between July 6 and September 15. Special evaluation surveys were flown in October. Flying time for surveys this year totaled 299.9 hours (table 38).

Managing foresters accompanied the regular survey crews on the flights over their respective areas. This provided a good understanding of the size and intensity of the timber owner's forest pest problems.

Table 38.--Summary of cooperative aerial survey activities in 1964

| Area covered | Timber area surveyed | Survey flight time: Mapping | Survey flight time: Ferry | Total |
|---|---|---|---|---|
| | M acres | Hours | Hours | Hours |
| Western Oregon | 14,815 | 61.8 | 14.5 | 76.3 |
| Eastern Oregon | 12,492 | 71.4 | 12.5 | 83.9 |
| Western Washington | 13,069 | 59.5 | 11.1 | 70.6 |
| Eastern Washington | 11,660 | 54.8 | 14.3 | 69.1 |
| All areas | 52,036 | 247.5 | 52.4 | 299.9 |

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Central Oregon District and adjacent forest lands (O.S.D.F.): | | | | | | |
| Fir engraver | 6 | 510 | 200 | 0 | 0 | 710 |
| Mountain pine beetle (P) | 1 | 520 | 0 | 0 | 0 | 520 |
| All insects | 7 | 1,030 | 200 | 0 | 0 | 1,230 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Coos District and adjacent forest lands (O.S.D.F.): | | | | | | |
| Balsam woolly aphid | 3 | 280 | 240 | 0 | 0 | 520 |
| Douglas-fir beetle | 601 | 13,970 | 3,500 | 1,960 | 200 | 19,630 |
| Mountain pine beetle (S) | 2 | 80 | 4,520 | 0 | 0 | 4,600 |
| Western pine beetle | 7 | 2,170 | 0 | 0 | 0 | 2,170 |
| All insects | 613 | 16,500 | 8,260 | 1,960 | 200 | 26,960 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Crater Lake N.P. | | | | | | |
| Balsam woolly aphid | 8 | 920 | 400 | 0 | 0 | 1,320 |
| Mountain pine beetle (L) | 8 | 1,880 | 120 | 0 | 0 | 2,000 |
| Mountain pine beetle (P) | 1 | 200 | 0 | 0 | 0 | 200 |
| Fir engraver | 1 | 40 | 0 | 0 | 0 | 40 |
| All insects | 18 | 3,040 | 520 | 0 | 0 | 3,560 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Deschutes N.F. and adjacent forest lands: | | | | | | |
| Needle miner, lodgepole pine | 2 | 0 | 2,800 | 0 | 0 | 2,800 |
| Balsam woolly aphid | 54 | 8,240 | 7,600 | 1,480 | 0 | 17,320 |
| Mountain pine beetle (L) | 26 | 2,670 | 5,660 | 770 | 0 | 9,100 |
| Western pine beetle | 19 | 3,010 | 2,000 | 0 | 0 | 5,010 |
| Mountain pine beetle (W) | 9 | 1,200 | 0 | 440 | 0 | 1,640 |
| Fir engraver | 3 | 50 | 240 | 0 | 0 | 290 |
| Oregon pine ips | 4 | 150 | 0 | 0 | 0 | 150 |
| Mountain pine beetle (P) | 3 | 120 | 0 | 0 | 0 | 120 |
| Mountain pine beetle (S) | 1 | 40 | 0 | 0 | 0 | 40 |
| All insects | 121 | 15,480 | 18,300 | 2,690 | 0 | 36,470 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Fremont N.F. and adjacent forest lands: | | | | | | |
| Fir engraver | 62 | 29,690 | 8,400 | 960 | 0 | 39,050 |
| Mountain pine beetle (L) | 54 | 12,430 | 7,420 | 2,100 | 0 | 21,950 |
| Western pine beetle | 40 | 10,110 | 5,880 | 0 | 0 | 15,990 |
| Mountain pine beetle (P) | 15 | 1,500 | 1,320 | 100 | 0 | 2,920 |
| Oregon pine ips | 4 | 340 | 0 | 200 | 0 | 540 |
| All insects | 175 | 54,070 | 23,020 | 3,360 | 0 | 80,450 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Lookout Mt. (B.L.M.) | | | | | | |
| Fir engraver | 2 | 480 | 0 | 0 | 0 | 480 |
| All insects | 2 | 480 | 0 | 0 | 0 | 480 |



See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Malheur N.F. and adjacent forest lands: | | | | | | |
| Douglas-fir tussock moth | 4 | 23,560 | 6,160 | 6,050 | 3,190 | 38,960 |
| Western pine beetle | 107 | 37,730 | 2,010 | 2,150 | 290 | 42,180 |
| Mountain pine beetle (P) | 23 | 3,770 | 1,540 | 1,420 | 0 | 6,730 |
| Fir engraver | 19 | 2,480 | 2,610 | 0 | 0 | 5,090 |
| Oregon pine ips | 17 | 710 | 550 | 550 | 390 | 2,200 |
| Mountain pine beetle (L) | 15 | 320 | 1,240 | 500 | 0 | 2,060 |
| Douglas-fir beetle | 8 | 680 | 130 | 0 | 0 | 810 |
| All insects | 193 | 69,250 | 14,240 | 10,670 | 3,870 | 98,030 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation: centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Mt. Hood N.F. and adjacent forest lands: | | | | | | |
| Sawfly on larch | 1 | 2,520 | 0 | 0 | 0 | 2,520 |
| Balsam woolly aphid | 58 | 15,400 | 2,260 | 0 | 0 | 17,660 |
| Mountain pine beetle (W) | 76 | 21,420 | 12,540 | 2,860 | 0 | 36,820 |
| Oregon pine ips | 7 | 950 | 50 | 0 | 0 | 1,000 |
| Douglas-fir beetle | 5 | 450 | 0 | 0 | 0 | 450 |
| Fir engraver | 1 | 120 | 0 | 0 | 0 | 120 |
| Mountain pine beetle (P) | 1 | 30 | 0 | 0 | 0 | 30 |
| All insects | 149 | 40,890 | 14,850 | 2,860 | 0 | 58,600 |
| Bear damage | 8 | 960 | 0 | 0 | 0 | 960 |
| All damage | 157 | 41,850 | 14,850 | 2,860 | 0 | 59,560 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All Intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Northwest Oregon District and adjacent forest lands (O.S.D.F.): | | | | | | |
| Balsam woolly aphid | 2 | 20 | 0 | 0 | 0 | 20 |
| All insects | 2 | 20 | 0 | 0 | 0 | 20 |
| Bear damage | 50 | 26,420 | 10,020 | 1,330 | 0 | 37,770 |
| Total | 52 | 26,440 | 10,020 | 1,330 | 0 | 37,790 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Ochoco N.F. and adjacent forest lands: | | | | | | |
| Douglas-fir tussock moth | 5 | 1,360 | 0 | 0 | 0 | 1,360 |
| Western pine beetle | 52 | 16,870 | 0 | 0 | 0 | 16,870 |
| Fir engraver | 36 | 9,490 | 440 | 0 | 0 | 9,930 |
| Mountain pine beetle (P) | 9 | 1,340 | 0 | 0 | 0 | 1,340 |
| Oregon pine ips | 6 | 740 | 0 | 0 | 0 | 740 |
| Douglas-fir beetle | 3 | 470 | 0 | 0 | 0 | 470 |
| All insects | 111 | 30,270 | 440 | 0 | 0 | 30,710 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Rogue River N.F. and adjacent forest lands: | | | | | | |
| Balsam woolly aphid | 16 | 14,760 | 2,720 | 1,120 | 160 | 18,760 |
| Mountain pine beetle (P) | 5 | 1,760 | 0 | 0 | 80 | 1,840 |
| Western pine beetle | 3 | 1,180 | 0 | 0 | 0 | 1,180 |
| Fir engraver | 7 | 1,170 | 0 | 0 | 0 | 1,170 |
| Mountain pine beetle (L) | 3 | 1,100 | 0 | 0 | 0 | 1,100 |
| Oregon pine ips | 3 | 880 | 0 | 0 | 0 | 880 |
| Mountain pine beetle (S) | 3 | 490 | 0 | 0 | 0 | 490 |
| Douglas-fir beetle | 2 | 240 | 0 | 0 | 0 | 240 |
| Mountain pine beetle (W) | 2 | 190 | 0 | 0 | 0 | 190 |
| Cedar bark beetle (Incense cedar) | 2 | 20 | 0 | 0 | 0 | 20 |
| All insects | 46 | 21,790 | 2,720 | 1,120 | 240 | 25,870 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Siskiyou N.F. and adjacent forest lands: | | | | | | |
| Douglas-fir beetle | 141 | 5,610 | 740 | 330 | 80 | 6,760 |
| Mountain pine beetle (W) | 3 | 4,340 | 0 | 0 | 0 | 4,340 |
| Western pine beetle | 10 | 3,120 | 0 | 0 | 0 | 3,120 |
| Mountain pine beetle (P) | 15 | 1,480 | 120 | 0 | 0 | 1,600 |
| Mountain pine beetle (S) | 6 | 1,030 | 0 | 0 | 0 | 1,030 |
| Mountain pine beetle (L) | 2 | 190 | 0 | 0 | 0 | 190 |
| All insects | 177 | 15,770 | 860 | 330 | 80 | 17,040 |
| Bear damage | 2 | 80 | 0 | 0 | 0 | 80 |
| Total | 179 | 15,850 | 860 | 330 | 80 | 17,120 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Siuslaw N.F. and adjacent forest lands: | | | | | | |
| Noctuid moth, Douglas-fir | 2 | 0 | 8,440 | 0 | 0 | 8,440 |
| Western oak looper | 22 | 5,670 | 640 | 120 | 0 | 6,430 |
| Balsam woolly aphid | 1 | 340 | 0 | 0 | 0 | 340 |
| Douglas-fir beetle | 290 | 17,790 | 100 | 0 | 0 | 17,890 |
| All insects | 315 | 23,800 | 9,180 | 120 | 0 | 33,100 |
| Bear damage | 35 | 5,380 | 1,720 | 0 | 0 | 7,100 |
| Total | 350 | 29,180 | 10,900 | 120 | 0 | 40,200 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation: centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Steens Mt. (B.L.M.) | | | | | | |
| Fir engraver | 1 | 200 | 0 | 0 | 0 | 200 |
| All insects | 1 | 200 | 0 | 0 | 0 | 200 |



See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Umatilla I.R.: | | | | | | |
| Fir engraver | 2 | 180 | 0 | 0 | 0 | 180 |
| Mountain pine beetle (P) | 1 | 80 | 0 | 0 | 0 | 80 |
| All insects | 3 | 260 | 0 | 0 | 0 | 260 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Umatilla N.F. and adjacent forest lands: | | | | | | |
| Fir engraver | 111 | 21,940 | 1,660 | 440 | 0 | 24,040 |
| Douglas-fir beetle | 73 | 9,400 | 1,240 | 0 | 0 | 10,640 |
| Western pine beetle | 37 | 8,170 | 0 | 0 | 0 | 8,170 |
| Mountain pine beetle (P) | 20 | 4,330 | 350 | 0 | 0 | 4,680 |
| Engelmann spruce beetle | 6 | 780 | 60 | 0 | 0 | 840 |
| Mountain pine beetle (L) | 4 | 530 | 0 | 0 | 0 | 530 |
| All insects | 251 | 45,150 | 3,310 | 440 | 0 | 48,900 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/] [2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Umpqua N.F. and adjacent forest lands: | | | | | | |
| Balsam woolly aphid | 42 | 12,640 | 3,410 | 1,810 | 100 | 17,960 |
| Mountain pine beetle (W) | 38 | 5,990 | 80 | 0 | 0 | 6,070 |
| Douglas-fir beetle | 9 | 2,360 | 0 | 0 | 0 | 2,360 |
| Western pine beetle | 3 | 140 | 600 | 0 | 0 | 740 |
| Mountain pine beetle (L) | 2 | 160 | 0 | 0 | 0 | 160 |
| All insects | 94 | 21,290 | 4,090 | 1,810 | 100 | 27,290 |
| Bear damage | 3 | 100 | 80 | 0 | 0 | 180 |
| Total | 97 | 21,390 | 4,170 | 1,810 | 100 | 27,470 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Wallowa-Whitman N.F. and adjacent forest lands: | | | | | | |
| Sawfly on larch | 2 | 160 | 0 | 0 | 0 | 160 |
| Douglas-fir beetle | 201 | 31,960 | 16,060 | 4,200 | 0 | 52,220 |
| Fir engraver | 89 | 29,560 | 6,560 | 0 | 0 | 36,120 |
| Mountain pine beetle (P) | 48 | 12,360 | 5,160 | 2,320 | 1,560 | 21,400 |
| Western pine beetle | 18 | 5,480 | 0 | 0 | 0 | 5,480 |
| Engelmann spruce beetle | 21 | 2,160 | 600 | 0 | 0 | 2,760 |
| Mountain pine beetle (L) | 5 | 1,360 | 0 | 0 | 80 | 1,440 |
| Oregon pine ips | 12 | 40 | 0 | 0 | 0 | 40 |
| All insects | 396 | 83,080 | 28,380 | 6,520 | 1,640 | 119,620 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Warm Springs I.R. | | | | | | |
| Balsam woolly aphid | 7 | 1,380 | 0 | 0 | 0 | 1,380 |
| Western pine beetle | 5 | 440 | 0 | 0 | 0 | 440 |
| Mountain pine beetle (W) | 2 | 200 | 0 | 0 | 0 | 200 |
| Mountain pine beetle (P) | 2 | 70 | 0 | 0 | 0 | 70 |
| All insects | 16 | 2,090 | 0 | 0 | 0 | 2,090 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Willamette N.F. and adjacent forest lands: | | | | | | |
| Balsam woolly aphid | 136 | 63,200 | 8,680 | 880 | 0 | 72,760 |
| Mountain pine beetle (W) | 137 | 20,720 | 13,200 | 8,800 | 720 | 43,440 |
| Douglas-fir beetle | 7 | 640 | 80 | 0 | 0 | 720 |
| Mountain pine beetle (L) | 1 | 0 | 0 | 0 | 160 | 160 |
| All insects | 281 | 84,560 | 21,960 | 9,680 | 880 | 117,080 |
| Bear damage | 15 | 6,080 | 800 | 320 | 0 | 7,200 |
| Total | 296 | 90,640 | 22,760 | 10,000 | 880 | 124,280 |

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Winema N.F. and adjacent forest lands: | | | | | | |
| Mountain pine beetle (L) | 55 | 8,310 | 6,410 | 1,660 | 720 | 17,100 |
| Western pine beetle | 26 | 9,790 | 170 | 0 | 0 | 9,960 |
| Fir engraver | 8 | 2,110 | 1,130 | 0 | 160 | 3,400 |
| Oregon pine ips | 9 | 840 | 700 | 0 | 280 | 1,820 |
| Mountain pine beetle (P) | 3 | 890 | 0 | 20 | 0 | 910 |
| All insects | 101 | 21,940 | 8,410 | 1,680 | 1,160 | 33,190 |

1/ Mountain pine beetle damage has been separated by tree species attacked: L, lodgepole pine; P, ponderosa pine; S, sugar pine; W, western white pine.

2/ Reporting areas are abbreviated as follows: N.F., National Forest; I.R., Indian Reservation; N.P., National Park; O.S.D.F., Oregon State Department of Forestry; B.L.M., Bureau of Land Management.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation

| Reporting area and insects involved 1/2/ | Infestation: centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Colville I.R. | | | | | | |
| Western pine beetle | 9 | 2,120 | 0 | 0 | 0 | 2,120 |
| Mountain pine beetle (P) | 8 | 2,070 | 0 | 0 | 0 | 2,070 |
| Douglas-fir beetle | 13 | 1,460 | 590 | 0 | 0 | 2,050 |
| Oregon pine ips | 7 | 410 | 330 | 0 | 0 | 740 |
| Mountain pine beetle (L) | 1 | 0 | 180 | 0 | 0 | 180 |
| Fir engraver | 1 | 80 | 0 | 0 | 0 | 80 |
| All insects | 39 | 6,140 | 1,100 | 0 | 0 | 7,240 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Colville N.F. and adjacent forest lands: | | | | | | |
| Douglas-fir tussock moth | 22 | 2,200 | 1,060 | 180 | 0 | 3,440 |
| Spruce budworm | 2 | 230 | 510 | 0 | 0 | 740 |
| Larch casebearer | 1 | 200 | 0 | 0 | 0 | 200 |
| Douglas-fir beetle | 26 | 2,530 | 1,900 | 200 | 0 | 4,630 |
| Mountain pine beetle (W) | 11 | 1,640 | 1,000 | 1,050 | 0 | 3,690 |
| Mountain pine beetle (L) | 3 | 670 | 1,130 | 1,740 | 0 | 3,540 |
| Mountain pine beetle (P) | 6 | 690 | 0 | 1,840 | 0 | 2,530 |
| Western pine beetle | 3 | 260 | 510 | 150 | 0 | 920 |
| Fir engraver | 3 | 230 | 260 | 0 | 0 | 490 |
| Oregon pine ips | 3 | 330 | 0 | 0 | 0 | 330 |
| All insects | 80 | 8,980 | 6,370 | 5,160 | 0 | 20,510 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Gifford Pinchot N.F. and adjacent forest lands: | | | | | | |
| Balsam woolly aphid | 53 | 17,900 | 5,560 | 2,400 | 0 | 25,860 |
| Mountain pine beetle (W) | 55 | 16,880 | 10,870 | 3,550 | 0 | 31,300 |
| Western pine beetle | 4 | 2,400 | 0 | 0 | 0 | 2,400 |
| Mountain pine beetle (L) | 2 | 680 | 200 | 0 | 0 | 880 |
| Mountain pine beetle (P) | 1 | 160 | 0 | 0 | 0 | 160 |
| Douglas-fir beetle | 5 | 460 | 0 | 0 | 0 | 460 |
| All insects | 120 | 38,480 | 16,630 | 5,950 | 0 | 61,060 |
| Bear damage | 25 | 9,580 | 8,800 | 160 | 680 | 19,220 |
| Total | 145 | 48,060 | 25,430 | 6,110 | 680 | 80,280 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Glenwood District and adjacent forest lands (W.S.D.N.R.): | | | | | | |
| Western pine beetle | 4 | 840 | 0 | 0 | 0 | 840 |
| Mountain pine beetle (P) | 2 | 520 | 0 | 0 | 0 | 520 |
| Oregon pine ips | 4 | 520 | 0 | 0 | 0 | 520 |
| All insects | 10 | 1,880 | 0 | 0 | 0 | 1,880 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Kaniksu N.F. and adjacent forest lands: | | | | | | |
| Larch casebearer | 31 | 13,820 | 9,420 | 3,000 | 3,940 | 30,180 |
| Spruce budworm | 1 | 1,310 | 440 | 310 | 0 | 2,060 |
| Mountain pine beetle (W) | 24 | 7,320 | 2,970 | 150 | 0 | 10,440 |
| Fir engraver | 7 | 2,510 | 330 | 0 | 0 | 2,840 |
| Douglas-fir beetle | 8 | 230 | 130 | 0 | 0 | 360 |
| All insects | 71 | 25,190 | 13,290 | 3,460 | 3,940 | 45,880 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Mt. Baker N.F. and adjacent forest lands: | | | | | | |
| Mountain pine beetle (W) | 36 | 1,590 | 920 | 1,760 | 0 | 4,270 |
| Silver fir beetles | 1 | 0 | 520 | 0 | 0 | 520 |
| Fir engraver | 2 | 0 | 280 | 0 | 0 | 280 |
| All insects | 39 | 1,590 | 1,720 | 1,760 | 0 | 5,070 |
| Dying hemlock | 135 | 62,260 | 41,000 | 10,120 | 1,960 | 115,340 |
| Total | 174 | 63,850 | 42,720 | 11,880 | 1,960 | 120,410 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Mt. Rainier N.P.: | | | | | | |
| Balsam woolly aphid | 6 | 640 | 0 | 480 | 0 | 1,120 |
| Mountain pine beetle (W) | 18 | 1,480 | 1,000 | 1,440 | 320 | 4,240 |
| All insects | 24 | 2,120 | 1,000 | 1,920 | 320 | 5,360 |



See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Northeast Washington District and adjacent forest lands (W.S.D.N.R.): | | | | | | |
| Larch casebearer | 31 | 46,980 | 19,120 | 11,900 | 4,530 | 82,530 |
| Douglas-fir tussock moth | 50 | 5,380 | 3,530 | 4,150 | 1,200 | 14,260 |
| Mountain pine beetle (W) | 4 | 720 | 0 | 0 | 0 | 720 |
| All insects | 85 | 53,080 | 22,650 | 16,050 | 5,730 | 97,510 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/ 2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| orthwest Washington and Puget Sound Districts and adjacent forest lands (W.S.D.N.R.): | | | | | | |
| Mountain pine beetle (W) | 3 | 1,420 | 140 | 0 | 0 | 1,560 |
| Dying hemlock | 6 | 2,720 | 360 | 1,920 | 840 | 5,840 |
| All damage | 9 | 4,140 | 500 | 1,920 | 840 | 7,400 |



See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/ 2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Okanogan N.F. and adjacent forest lands: | | | | | | |
| Douglas-fir beetle | 36 | 6,450 | 380 | 0 | 0 | 6,830 |
| Mountain pine beetle (P) | 16 | 2,660 | 2,050 | 1,540 | 230 | 6,480 |
| Western pine beetle | 10 | 2,970 | 840 | 0 | 0 | 3,810 |
| Fir engraver | 18 | 2,970 | 540 | 0 | 0 | 3,510 |
| Mountain pine beetle (L) | 6 | 1,100 | 790 | 280 | 0 | 2,170 |
| Engelmann spruce beetle | 3 | 280 | 0 | 0 | 0 | 280 |
| Mountain pine beetle (W) | 1 | 130 | 0 | 0 | 0 | 130 |
| All insects | 90 | 16,560 | 4,600 | 1,820 | 230 | 23,210 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/ 2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Olympic N.F. and adjacent forest lands: | | | | | | |
| Mountain pine beetle (W) | 31 | 7,830 | 6,020 | 1,840 | 180 | 15,870 |
| Bear damage | 55 | 28,060 | 3,890 | 440 | 0 | 32,390 |
| Dying hemlock | 28 | 47,050 | 13,780 | 0 | 0 | 60,830 |
| All damage | 83 | 75,110 | 17,670 | 440 | 0 | 93,220 |
| Total | 114 | 82,940 | 23,690 | 2,280 | 180 | 109,090 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Olympic N.P. | | | | | | |
| Mountain pine beetle (W) | 61 | 39,730 | 12,110 | 4,790 | 640 | 57,270 |
| Silver fir beetles | 1 | 150 | 0 | 0 | 0 | 150 |
| Douglas-fir beetle | 1 | 80 | 0 | 0 | 0 | 80 |
| All insects | 63 | 39,960 | 12,110 | 4,790 | 640 | 57,500 |
| Dying hemlock | 5 | 19,020 | 2,430 | 0 | 0 | 21,450 |
| Total | 68 | 58,980 | 14,540 | 4,790 | 640 | 78,950 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/ 2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Quinault I.R.: | | | | | | |
| Mountain pine beetle (W) | 3 | 2,050 | 0 | 130 | 0 | 2,180 |
| Bear damage | 5 | 1,820 | 460 | 0 | 0 | 2,280 |
| Total | 8 | 3,870 | 460 | 130 | 0 | 4,460 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/] [2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Snoqualmie N.F. and adjacent forest lands: | | | | | | |
| Balsam woolly aphid | 24 | 4,320 | 1,320 | 160 | 0 | 5,800 |
| Mountain pine beetle (W) | 53 | 16,120 | 4,920 | 1,360 | 240 | 22,640 |
| Fir engraver | 3 | 840 | 0 | 0 | 0 | 840 |
| Silver fir beetles | 4 | 560 | 0 | 0 | 0 | 560 |
| Douglas-fir beetle | 2 | 230 | 0 | 0 | 0 | 230 |
| Oregon pine ips | 1 | 10 | 0 | 0 | 0 | 10 |
| All insects | 87 | 22,080 | 6,240 | 1,520 | 240 | 30,080 |
| Bear damage | 10 | 5,660 | 900 | 200 | 0 | 6,760 |
| Total | 97 | 27,740 | 7,140 | 1,720 | 240 | 36,840 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/ 2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Spokane I.R. | | | | | | |
| Western pine beetle | 4 | 950 | 330 | 0 | 0 | 1,280 |
| Oregon pine ips | 4 | 150 | 50 | 0 | 0 | 200 |
| All insects | 8 | 1,100 | 380 | 0 | 0 | 1,480 |



See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved [1/] [2/] | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Southwest Washington Districts and adjacent forest lands (W.S.D.N.R.): | | | | | | |
| Balsam woolly aphid | 1 | 1,040 | 0 | 0 | 0 | 1,040 |
| Western hemlock looper | 8 | 330 | 320 | 0 | 0 | 650 |
| All insects | 9 | 1,370 | 320 | 0 | 0 | 1,690 |
| Bear damage | 22 | 8,860 | 2,160 | 1,370 | 0 | 12,390 |
| Total | 31 | 10,230 | 2,480 | 1,370 | 0 | 14,080 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/ 2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Umatilla N.F. and adjacent forest lands: (Wn. portion) | | | | | | |
| Fir engraver | 15 | 4,000 | 0 | 0 | 0 | 4,000 |
| Douglas-fir beetle | 23 | 2,710 | 0 | 0 | 0 | 2,710 |
| Mountain pine beetle (P) | 5 | 1,270 | 0 | 0 | 0 | 1,270 |
| Western pine beetle | 2 | 510 | 0 | 0 | 0 | 510 |
| Engelmann spruce beetle | 3 | 320 | 0 | 0 | 0 | 320 |
| Oregon pine ips | 3 | 120 | 0 | 0 | 0 | 120 |
| All insects | 51 | 8,930 | 0 | 0 | 0 | 8,930 |

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Wenatchee N.F. and adjacent forest lands; | | | | | | |
| Balsam woolly aphid | 2 | 720 | 0 | 0 | 0 | 720 |
| Mountain pine beetle (W) | 98 | 11,860 | 4,800 | 3,860 | 120 | 20,640 |
| Fir engraver | 26 | 1,820 | 1,040 | 0 | 0 | 2,860 |
| Mountain pine beetle (L) | 2 | 1,120 | 680 | 0 | 0 | 1,800 |
| Western pine beetle | 14 | 1,660 | 80 | 0 | 0 | 1,740 |
| Douglas-fir beetle | 7 | 480 | 280 | 0 | 0 | 760 |
| Oregon pine ips | 2 | 80 | 80 | 0 | 0 | 160 |
| Mountain pine beetle (P) | 1 | 0 | 0 | 0 | 120 | 120 |
| All insects | 152 | 17,740 | 6,960 | 3,860 | 240 | 28,800 |

See footnotes at end of table.

Table 40.--Extent of infestation in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

| Reporting area and insects involved 1/2/ | Infestation: centers | Intensity of infestation: Light | Moderate | Heavy | Very heavy | All intensities |
|---|---|---|---|---|---|---|
| | Number | Acres | | | | |
| Yakima I.R.: | | | | | | |
| Balsam woolly aphid | 2 | 440 | 400 | 0 | 0 | 840 |
| Western pine beetle | 21 | 9,520 | 960 | 0 | 0 | 10,480 |
| Mountain pine beetle (W) | 5 | 240 | 240 | 560 | 0 | 1,040 |
| Mountain pine beetle (P) | 2 | 520 | 160 | 0 | 0 | 680 |
| Mountain pine beetle (L) | 1 | 0 | 200 | 0 | 0 | 200 |
| Fir engraver | 1 | 320 | 0 | 0 | 0 | 320 |
| All insects | 32 | 11,040 | 1,960 | 560 | 0 | 13,560 |
| Bear damage | 1 | 240 | 0 | 0 | 0 | 240 |
| Total | 33 | 11,280 | 1,960 | 560 | 0 | 13,800 |

1/ Mountain pine beetle damage has been separated by tree species attacked: L, lodgepole pine; P, ponderosa pine; W, western white pine.

2/ Reporting areas are abbreviated as follows: N.F., National Forest; I.R., Indian Reservation; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources.

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